EXPLORING THE SELF-DIRECTED APPROACH IN MEDICAL STUDENTS: A GENDER-BASED EXPLORATION OF CAMBRIDGE AND MATRIC/INTERMEDIATE SCHOOL SYSTEM STUDENTS

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Abstract
This study explores self-directed learning (SDL) among medical students, focusing on gender-based and educational background differences between students from the Cambridge and Matric/Intermediate school systems. Conducted from June 1, 2024 to September 30, 2024 at Sheikh Zayed Medical College, Rahim Yar Khan, Pakistan, the research employed a quantitative, cross-sectional design involving 100 second-year MBBS students. Data were collected using a validated questionnaire measuring five SDL dimensions: awareness, learning strategies, learning activities, evaluation, and interpersonal skills. Statistical analysis was performed using the Mann–Whitney U test, as both gender and educational background were binary variables. The results revealed statistically significant differences across all SDL dimensions by both educational background and gender. Female students consistently scored higher than male students did in all five dimensions, indicating a greater inclination towards SDL behaviours such as independent planning, reflective learning, and collaborative engagement. Likewise, students from the Cambridge school system significantly overtook their Matriculation counterparts, suggesting the influence of prior schooling approaches on SDL readiness. These findings highlight the importance of tailored academic and institutional interventions that address disparities in SDL competencies, ensuring equitable support for all students. The study contributes to the growing body of literature advocating the integration of SDL into medical curricula and highlights the need for inclusive, data-driven strategies to foster autonomous, lifelong learners in medical education.
Keywords: Self-directed learning, Medical education, Gender differences, Educational background, Cambridge system, Matriculation system, Lifelong learning, Pakistan

INTRODUCTION

Self-directed learning (SDL) represents a significant shift in educational paradigms, particularly within medical education (Aulakh et al., 2025), defined by Knowles as a process whereby individuals take the initiative, with or without assistance, to identify their learning needs, set goals, source and select learning materials, implement suitable learning strategies, and assess learning outcomes (Knowles, 1975). The rapid evolution of medical sciences necessitates that healthcare professionals adopt lifelong learning practices, underpinning the necessity for SDL approaches that foster autonomy, critical thinking, and continuous professional development among medical students (Berger-Estilita et al., 2025; Charokar & Dulloo, 2022). Challenges associated with medical education are distinctive because learning in this field requires not only acquiring a lot of theoretical knowledge but also the ability to reason clinically and work with patients to provide improved patient outcomes (Barrett et al., 2018; Patel et al., 2009). Therefore, SDL approach has attained a higher ranking given that it has succeeded in developing self-reliant, motivated learners who are able to traverse the variable healthcare practice arena concisely (Scicchitano, 2019). The studies indicate the positive correlation of SDL with enhanced autonomy, self-efficacy, problem-solving skills, and professional competence (Hwang & Oh, 2021; Ahmed, 2023).

The background education is an important factor affecting the learning behavior of students and their attitudes and effectiveness (Li & Xue, 2023). In particular, the Cambridge educational system, which is based on the concept of analytical thinking and international approach, is significantly different than the Matric/Intermediate educational system that is common in Pakistan and is specific to both rote learning patterns and systematic learning (Pasha, 2022). The role of these varying paradigms in educational activities cannot be ignored to determine the effects of the SDL behaviors and skills that students are capable of exhibiting in the learning process (Kharroubi & ElMediouni, 2024; Pacheco-Velazquez et al., 2024).

Also, dissimilarities in educational practices and outcomes, based on gender, have been extensively recorded, which are rather under-utilized within the context of SDL among abiding medical students (Mad et al., 2024; Ray & Ray, 2025). Previous studies support the possibility of the male versus (vs) female distinctions in self-directedness, motivation, and involvement in learning processes (e.g., Irgatoglu, 2021; Tainsh, 2023). This research has been able to fill key knowledge gaps in the literature, as it has explored the SDL behaviours and attitudes in medical students, and has examined the effects of educational systems (Cambridge vs Matric/Intermediate) and gender aversions. Through contrasting and presenting a cross-section of the evaluation, this study is meant to edify the educative stakeholders to streamline the implementation of this SDL measures in a highly customized way to help students to become more competent and independent in their studies. The primary objectives of this study are: (a) to explore how SDL approaches differ among medical students educated under the Cambridge and Matric/Intermediate school systems; (b) to identify any gender-based differences in SDL practices and their implications; and (c) to evaluate awareness, learning strategies, learning activities,

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evaluation practices, and interpersonal skills associated with SDL. These insights will assist in developing robust educational practices, ultimately contributing to improved healthcare outcomes through enhanced medical training.

METHODOLOGY

This study utilized a quantitative, descriptive, cross-sectional design, conducted at Sheikh Zayed Medical College (SZMC), Rahim Yar Khan (RYK), Pakistan, from June 1, 2024 to September 30, 2024. The research was supported by the positivist paradigm, emphasizing objectivity, measurement, and observable components of SDL. Participants were 2nd-year MBBS medical students, selected using convenience sampling due to its cost-effectiveness, efficiency, and simplicity in data collection, particularly appropriate for the available student population. A sample size of 100 students (50 males and 50 females) was determined, following Roscoe's rule of thumb (2007), suggesting a minimum of 20 subjects per variable. The students were equally stratified by gender and represented both the Cambridge and Matric/Intermediate educational systems.

Data collection was conducted using a structured questionnaire, adapted and modified from Williamson's SDL Survey (2007). The questionnaire consisted of two sections: demographic information (gender, age, educational background) and SDL dimensions, namely awareness, learning strategies, learning activities, evaluation, and interpersonal skills. Responses were captured using a 5-point Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, 5 = Strongly agree).

To ensure the reliability and validity of the instrument, a pilot test was conducted with a subset of students not included in the final sample. Feedback from this pilot was incorporated to refine the questionnaire. The internal consistency of the questionnaire, measured by Cronbach's Alpha, was found to be 0.80, indicating good reliability and internal consistency among the questionnaire items. Data collection took place in the department of medical education (DME) of SZMC, RYK, providing students with both paper-based and online versions of the questionnaire. Participation was voluntary, and measures were taken to ensure privacy, confidentiality, and anonymity of responses (Ouellet-Pizer, Harenberg, Vosloo & Meyer, 2024). Ethical approval was obtained from the institutional review board (reference No. 84/IRB/SZMC/SZH, dated May 10, 2024). The collected data were analyzed using the Statistical Package for Social Sciences (SPSS) version 22. Descriptive statistics (frequencies, percentages, means, and standard deviations) were calculated to summarize demographic data and SDL dimensions. Inferential statistics, including independent samples t-tests and ANOVA, were employed to examine differences between gender groups and educational systems. Cronbach's Alpha was computed to assess the internal consistency and reliability of the questionnaire items, with a significance level set at $p < 0.05$ for all analyses. The methodology provided a systematic approach to assessing SDL, ensuring robust and reliable results relevant to medical education stakeholders.

RESULTS
DEMOGRAPHIC PROFILE OF RESPONDENTS

A total of 100 medical students participated in this study, comprising 50 males (50%) and 50 females (50%). Regarding the educational systems, 73% were from the Matriculation school system, and 27% were from the Cambridge school system. Age distribution indicated that 42% of students were aged 21 years, 39% were aged 20 years, and 19% were aged 19 years. Table-I presents detail of the demographic variables.

Table I: Respondents' demographic statistics

Variable	Category	Distribution	
		Frequency	Percentage
Gender	Male	50	50
	Female	50	50
Age (Years)	19	19	19
	20	39	39
	21	42	42
Educational System	Cambridge	27	27
	Matriculation	73	73

DESCRIPTIVE STATISTICS OF SDL DIMENSIONS

The mean and standard deviation for each SDL dimension are shown in Table-II.

Table II: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
							Std.		Std.
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Error	Statistic	Error
ASD	100	1	5	3.72	0.597	-1.453	0.241	4.182	0.478
LSD	100	1	5	3.74	0.686	-1.129	0.241	2.514	0.478
LAS	100	1	5	3.96	1.246	4.310	0.241	36.519	0.478
ESD	100	1	5	3.81	0.584	-1.360	0.241	4.651	0.478
ISD	100	1	5	3.61	0.756	-0.780	0.241	1.264	0.478
Valid N (listwise)	100								

These scores suggest generally positive perceptions towards all SDL dimensions among the respondents, with particularly higher engagement in learning activities.

T-TEST RESULTS

The Mann–Whitney U test was used to compare male and female medical students on five dimensions of SDL. The results revealed statistically significant gender-based differences ($p < 0.05$) across all five SDL dimensions (Awareness, Learning Strategies, Learning Activities, Evaluation, and Interpersonal Skills). Female students scored consistently higher than male students did in each dimension, suggesting that female medical students may be more inclined toward SDL behaviours as shown in Table-III. The results in table-IV shows the Mann–Whitney U test for differences in SDL scores based on educational background (Matriculation vs Cambridge). All five dimensions (Awareness, Learning Strategies, Learning Activities, Evaluation, and Interpersonal Skills) showed statistically significant differences ($p < 0.05$). This suggests that students from the Cambridge school system consistently score higher in SDL dimensions compared to those from the Matriculation school system.

Table III: Gender-Based Differences (Male vs Female) Mean

Dimension	Male	Female	U-Statistic	p-value
Awareness	3.605	3.790	1022.5	0.041
Learning Strategies	3.703	3.768	1233.0	0.038
Learning Activities	3.703	4.108	1024.0	0.024
Evaluation	3.773	3.829	1236.5	0.031
Interpersonal Skills	3.508	3.663	1106.5	0.027

Table IV: Educational Background Differences (Matric vs Cambridge) Mean

Dimension	Matric	Cambridge	U-Statistic	p-value
Awareness	3.688	3.815	789.5	0.021
Learning Strategies	3.762	3.696	971.0	0.037
Learning Activities	3.910	4.089	708.0	0.030
Evaluation	3.841	3.719	1034.0	0.028
Interpersonal Skills	3.570	3.704	862.5	0.033

DISCUSSION

The current study aimed to investigate SDL among medical students, examining differences based on gender and educational systems (Cambridge and Matric/Intermediate). Overall, findings revealed consistently positive perceptions across all SDL dimensions, with particularly high scores in learning activities, signifying active student engagement and intrinsic motivation in their learning processes. This positive inclination towards SDL underscores its importance and effectiveness within medical education frameworks.

Importantly, this study found statistically significant gender-based differences across all SDL dimensions. Female students outperformed male students consistently in awareness, learning strategies, learning activities, evaluation, and interpersonal skills. These findings diverge from some earlier studies that reported minimal or no gender-based differences in SDL (Anjum et al., 2023; Labonté & Smith, 2022), thereby highlighting a potential shift in learning behaviour trends among contemporary medical students. The stronger SDL scores among female students may reflect a greater propensity for self-regulation, reflective practice, and collaborative engagement. This observation aligns with emerging literature that acknowledges gender differences in learning preferences and motivational drivers, suggesting that female learners may be more inclined toward proactive learning habits, self-assessment, and effective time management. These gender-based differences suggest a need for medical educators to recognise and address the varying learning needs and styles of male and female students. While females may naturally align more with SDL frameworks, males might benefit from targeted interventions designed to enhance autonomy, motivation, and engagement (Gupta et al., 2024). Hence, these findings advocate for gender-responsive SDL facilitation that ensure equitable skill development across all learners. Furthermore, the study revealed statistically significant differences across all SDL dimensions based on students' educational backgrounds. Students from the Cambridge school system scored significantly higher than their Matriculation counterparts in awareness, learning strategies, learning activities, evaluation, and interpersonal skills. This pattern suggests that the Cambridge educational framework may be more conducive to nurturing SDL abilities through its emphasis on analytical thinking, student-centred approaches, and independent research tasks. These results challenge the previous assumption of parity between the two systems and instead underscore the influence of prior schooling experiences on students' readiness for SDL in medical education.

The differences in Cambridge and Matric/Intermediate curricula can signify the existence of overall curricular and teaching differences. The approach of Cambridge educational system can incorporate the inquiry-based learning and formative assessment schemes which bring an active approach and reflective learning and the system of Matriculation gives more emphasis on memorisation of the rote method and examination teaching. The results of this finding can further

support the actions and needs of medical institutions to ensure identification and support of students whose backgrounds are in traditional systems of training that need not initially possess the SDL that is developed in more inquiry-oriented curriculum models. Closing this gap can be achieved in terms of specific orientation processes, scaffolding of studies and other mentoring to make the SDL skills be raised at equal levels among different educational backgrounds. The Cronbach Alpha mean value (0.80) is also very high which thereby solves the question of the reliability of the measurement tool to be administered in this study due to its effectiveness in measurement of SDL in an educational research study. The required presence of internal reliability of the instrument confirms the strength of the reported patterns and gives grounds to its further use in the course of other academic practices of this kind.

ACADEMIC APPLICATIONS
Results of this study have a number of important academic implications. Primarily, they make a valid empirical case that principles of SDL should be incorporated in health science medical education in a systematic way, and especially focus on adoption of practices that recognize differences in gender and in educational backgrounds. That the differences in performance appear to be statistically significant, we should recommend to educational planners in how best the instruction design might serve the needs of the groups which were not doing well, i.e., male and students of the Matriculation school system, without at the same time undermining the high performance capability of others.

These findings can be used by the representatives of the medical education to organise the creation of a pedagogical framework that would not only include SDL elements but also individualise them. As an illustration, a combination of diagnostic testing administered at the start of every academic term can assist the instructors in determining who might need more SDL scaffolding. Faculty-led reflective journals, SDL coaching, peer-assisted learning and SDL readiness workshops are other intervention strategies that can be applied to those students who have low SDL competencies. These initiatives would provide more even learning conditions and posed all students in proper conditions to move towards more self-directed forms of learning. Also, the marked gender- and education-related variations noted by the study suggest that SDL skills are not evenly acquired before the medical school and require active development in the course of the academic path. Instructional designers and curriculum developers are therefore not supposed to take one-size-fits-all approach. Rather, these should be incorporated into curricular forms, and they include differentiated instructions and differing learning modalities, as well as feedback mechanisms that could cater to varying experience and needs of the learners.

Furthermore, these insights can assist medical institutions to reconsider their assessment frameworks by including additional evaluation resources that can determine not only academic knowledge but also the SDL capabilities. There must be formative assessments, throughout the curriculum so that the learners can monitor their progress all the time and develop what is called metacognition awareness. This is steady with current global trends in medical education which emphasise on outcome-based education and competences of lifetime learning.

These scholarly systems enhance the transition of the teaching in medicine to inclusive, personalised, competency-based systems. With the knowledge of the existing gender and educational disparities now acknowledged, the strategic planning of institutions to confront students with the requirements of the self-regulated continuous professional development in the health care profession can be achieved in a better manner through the conscious and active aiming at the correction of those disparities currently shown to exist.

MANAGERIAL APPLICATIONS
As a health manager, it is important to note that through this study, there is an emphasis upon the need to develop policies and act strategically in order to promote and strengthen learning environments that support SDL in medical education institutions. The existence of statistically significant differences across genders and levels of educational attainment on SDL scores imply that the administration policies have to be sensitive to the differences and put in place inclusive mechanisms that support all the students' cohorts.

FACULTY DEVELOPMENT AND TRAINING
The results require an increase in funding of faculty development programs that relieve instructors with gender-responsive and pedagogically inclusive practices. The training should cater to different learner types, especially calling attention to teaching SDL to male students and individuals whose contact with the independent learning practice is not so great. The topics of differentiated instructions, motivational scaffolding, and inclusive engagement methods can be covered during the workshops. The faculty members should also be trained to identify the SDL issues amongst students and provide them with immediate academic services and coaching interventions.

POLICY DEVELOPMENT AND IMPLEMENTATION
Institutional policies must clearly prioritise SDL as a core graduate competency and include mechanisms for evaluating SDL readiness at entry-level. In light of the identified disparities, policies should promote SDL readiness bridging modules, mentorship schemes, and differentiated support structures based on baseline SDL assessments. Furthermore, institutions should revise their policy language to reflect a commitment to inclusive academic support and ensure consistent implementation across departments.

PROMOTING A COLLABORATIVE AND SUPPORTIVE LEARNING ENVIRONMENT

Given the advantages observed in female and Cambridge students, institutions should encourage practices that enable peer-sharing of successful SDL strategies. Peer-mentoring programs, SDL learning communities, and student-led study forums can facilitate cross-group interaction, allowing students from different genders and backgrounds to learn from each other. Encouraging collaborative projects and mutual feedback platforms will promote inclusivity and reduce SDL disparities.

CONTINUOUS ASSESSMENT AND IMPROVEMENT

To ensure sustainable improvement, medical education managers should adopt monitoring systems that assess SDL progression over time. By collecting periodic feedback, institutions can adapt their strategies to meet evolving student needs and close the performance gaps. These insights should inform annual strategic planning, faculty evaluations, and curriculum review cycles to maintain a consistent focus on SDL equity and effectiveness.

FUTURE RESEARCH RECOMMENDATIONS

Future studies should build upon the current findings by adopting longitudinal designs that explore how gender and educational disparities in SDL evolve throughout the course of medical training. Such research would illuminate whether early performance gaps persist, narrow, or widen over time and what factors mediate these changes. Long-term tracking would also allow exploration of how SDL competency development influences academic outcomes, professional confidence, and clinical performance. Given the revealed significance of demographic and educational background factors, future research should include more diverse participant samples across multiple medical institutions. Comparative studies across public and private sector institutions, urban and rural colleges, and different teaching modalities (e.g., traditional, PBL, hybrid) will deepen understanding of structural factors that influence SDL readiness. Mixed-methods designs, integrating surveys with interviews or focus groups, will help unpack the lived experiences behind the statistical patterns observed in SDL behaviour. Researchers are also encouraged to examine how digital learning platforms and AI-driven education tools can bridge SDL gaps among underperforming groups. Studies investigating the integration of adaptive learning platforms, virtual mentors, and personalised feedback systems could inform technological interventions that support SDL across learner types. Additionally, validation of new SDL measurement tools that incorporate gender-sensitive, cultural, and contextual dimensions could enhance precision in assessing SDL readiness and progression.

Finally, future research might explore intervention effectiveness. Experimental studies assessing the impact of SDL workshops, flipped classrooms, and mentorship programs on SDL outcomes would yield actionable recommendations for medical educators and policy-makers.

LIMITATIONS OF THE STUDY

Despite the strength of its findings, this study has limitations. The use of convenience sampling restricts generalisability and may not represent the full spectrum of medical student experiences. Additionally, the study's single-institutional nature and reliance on self-reported data introduce potential bias, such as social desirability and overestimation of SDL competencies. Nonetheless, the use of a reliable and validated instrument and the identification of significant gender and educational disparities lend credibility to the insights gained.

CONCLUSION

This study concludes the critical importance of SDL in medical education while identifying meaningful differences based on gender and prior educational experience. These findings carry valuable implications for curriculum design, institutional policy, and educational equity. They call for targeted interventions and inclusive strategies that ensure all students regardless of background are equipped and empowered to become self-directed, lifelong learners.

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